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REMARKS/ARGUMENTS

Claims 1 and 3-24 are pending in this application.

Claims 1 and 4-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Atwood et al. (U.S. 6,656,770) in view of Tonti et al. (U.S. 5,773,362), and further in view of Sono et al. (U.S. 5,444,025). Claim 3 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Atwood et al. in view of Tonti et al. and Sono et al., and further in view of Huang et al. (U.S. 2002/0180035). Applicants respectfully traverse the rejections of claims 1 and 3-24.

Claim 1 recites:

"A process for manufacturing an integrated circuit package comprising:

mounting a semiconductor die, to a first surface of a substrate such that bumps on said semiconductor die are electrically connected to conductive traces of said substrate;

mounting at least one collapsible spacer to at least one of a heat spreader, said semiconductor die and said substrate;

fixing said heat spreader to at least one of said first surface of said substrate and said semiconductor die such that said at least one collapsible spacer is disposed therebetween;

forming a ball grid array on a second surface of said substrate, bumps of said ball grid array being electrically connected to said conductive traces; and

singulating said integrated circuit package,

wherein fixing said heat spreader comprises:

placing one of said heat spreader and said substrate in a mold cavity of a mold;

releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate; and

molding a molding compound in the mold cavity, thereby molding the semiconductor die, the substrate, said at least one collapsible spacer and said heat spreader into the molding compound to provide a molded package." (emphasis added)

Claim 15 recites features and method steps that are similar to the features and

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method steps recited in claim 1, including the above-emphasized features.

The Examiner acknowledged that neither Atwood et al. nor Tonti et al. teaches or suggests the steps of "placing one of said heat spreader and said substrate in a mold cavity of a mold," "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" and "molding a molding compound in the mold cavity, thereby molding the semiconductor die, the substrate, said at least one collapsible spacer and said heat spreader into the molding compound to provide a molded package" as recited in Applicants' claims 1 and 15. However, the Examiner alleged that Sono et al. teaches these steps. Thus, the Examiner concluded that it would have been obvious "to use the molding of Sono [et al.] with the process of Atwood [et al.] in view of Tonti [et al.] in order to provide a highly accurate placement of the heatsink." Applicants respectfully disagree.

Applicants agree with the Examiner that the radiator block 3 of Sono et al. is placed in the mold cavity of the mold 24a, as seen in Fig. 3(B) of Sono et al. However, Sono et al. clearly fails to teach or suggest the step of "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 15. Since the radiator block 3 of Sono et al. is considered by the Examiner to correspond to the heat spreader recited in Applicants' claims 1 and 15, in order for Sono et al. to teach that the other of the heat spreader and the substrate is clamped to a die of the mold cavity, a substrate must necessarily be clamped to the die of the mold cavity.

However, col. 4, lines 16-20 of Sono et al. clearly teaches that positioning pins 23 are provided on a palette 21 to position the lead frame 2. Col. 4, lines 16-24 clearly discloses that "the palette 21 is made of a metal which has a coefficient of thermal expansion close to or approximately the same as that of the lead frame 2." Thus, a metal lead frame is taught by Sono et al. This is completely different from a substrate,

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as recited in Applicants' claims 1 and 15. The substrate recited in Applicants' claims 1 and 15 is defined as including conductive traces. The lead frame 2 of Sono et al. is completely different from the substrate as recited in Applicants' claims 1 and 15, and thus, cannot be fairly construed as a substrate as recited in Applicants' claims 1 and 15, and in fact, Sono et al. fails to teach or suggested any such substrate. Therefore, contrary to the Examiner's allegations, Sono et al. certainly fails to teach or suggest the step of "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 15.

In the Response to Arguments section on pages 7 and 8 of the outstanding Office Action, the Examiner alleged that Sono et al. teaches the use of a substrate in Figs. 5(C) and 5(D). In particular, the Examiner alleged that element 33 in Fig. 5(C) and element 35 in Fig. 5(D) are substrates. This is clearly incorrect.

Element 33 of Sono et al. is disclosed as being a mounting part made of copper, for example (see col. 5, lines 28-31) and element 35 is disclosed as being a metal layer (see col. 5, lines 51-54). Thus, neither element 33 nor element 35 can be fairly construed as a substrate including conductive traces, as recited in Applicants' claims 1 and 15.

Even assuming *arguendo* that either of elements 33 and 35 could be fairly construed as a substrate as recited in Applicants' claims 1 and 15, Sono et al. would still clearly fail to teach or suggest the step of "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 15. Particularly, since elements 33 and 35 of Sono et al. are disposed on top of the radiator block 3, these elements cannot be clamped to either of the die members 24a or 24b of Sono et al.

Therefore, Sono et al. certainly fails to teach or suggest the step of "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity,

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such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" as recited in Applicants' claims 1 and 15.

Furthermore, the Examiner is clearly picking and choosing portions of the cited prior art references in an attempt to assemble the integrated circuit package as recited in Applicants' claims 1 and 15 and in alleging that these claims are obvious over Atwood et al. in view of Tonti et al. and Sono et al. The Examiner alleged that Atwood et al. teaches the step of mounting a semiconductor die to a first surface of a substrate such that bumps on the semiconductor die are electrically connected to conductive traces of the substrate. In addition, the Examiner incorrectly alleged that Sono et al. teaches releasably clamping the substrate to a die of the mold cavity while ignoring the fact that no semiconductor die is mounted to the lead frame 2 of Sono et al. In addition, the Examiner is ignoring the fact that the lead frame 2 is not a substrate as recited in Applicants' claims 1 and 15. Furthermore, the Examiner has ignored the fact that elements 33 and 35 of Sono et al. are not and cannot be releasably clamped to a die of the mold cavity, but instead, are fixed to the radiator block, as seen in Figs. 5(C) and 5(D) of Sono et al.

In addition, as described above, the Examiner incorrectly alleged that Sono et al. teaches the step of "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate," and further alleged that Atwood et al. teaches a collapsible spacer that is disposed between the heat spreader and the substrate.

However, Atwood et al. completely fails to teach or suggest releasably clamping either of a heat spreader or a substrate to a die of a mold cavity. Thus, the combination of Atwood et al. and Sono et al. cannot possibly teach or suggest a step of disposing collapsible spacers between the heat spreaders and the substrate when either the heat spreader or the substrate is releasably clamped to a die of the mold cavity, as recited in Applicants' claims 1 and 15.

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In the present invention, the collapsible spacers are used during the steps of releasably clamping to provide a compliant layer between the substrate and the heat spreader. Thus, the heat spreader is pressed against the lower mold die during molding, to thereby maintain the heat spreader in contact with the lower mold die during molding. This results in reduced mold flash. None of the cited prior art references teaches or suggest the use of such a compliant layer during the step of releasably clamping one of the heat spreader and the substrate to a die of the mold cavity while the other of the heat spreader and the substrate is placed in the mold cavity.

The Examiner has improperly ignored the teachings of the prior art as a whole and the unique combination and arrangement of elements recited in Applicants' claims 1 and 15. The Supreme Court has frequently warned against the use of "hindsight" in determining obviousness (see, for example, Diamond Rubber Col. v. Consolidated Rubber Tire Co., 220 U.S. 428 (1991)). In In re Mahurkar Patent Litigation, 831 F.Supp 1354, 28 USPQ2d 180 (N.D. Ill. 1993), Judge Easterbrook noted that "decomposing an invention into its constituent elements, finding each element in the prior art, and then claiming that it is easy to reassemble these elements into the invention, is a forbidden ex post analysis."

The Examiner is clearly using Applicants' claimed invention as a template in order to piece together the teachings of the prior art to render the claims obvious. It is impermissible to use the disclosure of the present invention as a "road map" for selecting and combining prior art disclosures. In In re Wesslau, 353 F.2d 238, 147 USPQ 391 (CCPA 1965), the Court of Customs and Patent Appeals cautioned that "it is impermissible within the framework of Section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art."

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1 and 15 under 35 U.S.C. § 103(a) as being unpatentable over

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Atwood et al. in view of Tonti et al. and Sono et al.

The Examiner relied upon Huang et al. to allegedly cure a deficiency of the combination of Atwood et al., Tonti et al. and Sono et al. However, Huang et al. clearly fails to teach or suggest the steps of "placing one of said heat spreader and said substrate in a mold cavity of a mold," "releasably clamping the other of said heat spreader and said substrate to a die of said mold cavity, such that said at least one collapsible spacer is disposed between said heat spreader and said substrate" and "molding a molding compound in the mold cavity, thereby molding the semiconductor die, the substrate, said at least one collapsible spacer and said heat spreader into the molding compound to provide a molded package" as recited in Applicants' claims 1 and 15.

Accordingly, Applicants respectfully submit that Atwood et al., Tonti et al., Sono et al. and Huang et al., applied alone or in combination, fail to teach or suggest the unique combination and arrangement of method steps and features recited in Applicants' claims 1 and 15.

In view of the foregoing amendments and remarks, Applicants respectfully submit that Claims 1 and 15 are allowable. Claims 3-14 and 16-24 depend upon claims 1 and 15, and are therefore allowable for at least the reasons that claims 1 and 15 are allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

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The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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